

## 1. Green Roof

**Definition.** Practices that capture and store rainfall in an engineered growing media that is designed to support plant growth. A portion of the captured rainfall evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites. Green roofs typically contain a layered system of roofing, which is designed to support plant growth and retain water for plant uptake while preventing ponding on the roof surface. The roofs are designed so that water drains vertically through the media and then horizontally along a waterproofing layer towards the outlet. Extensive green roofs are designed to have minimal maintenance requirements. Plant species are selected so that the roof does not need supplemental irrigation or fertilization after vegetation is initially established.

Design variants include:

- G-1 Extensive green roofs have a much shallower growing media layer that typically ranges from 3 to 6 inches thick
- G-2 Intensive green roofs have a growing media layer that ranges from 6 to 48 inches thick

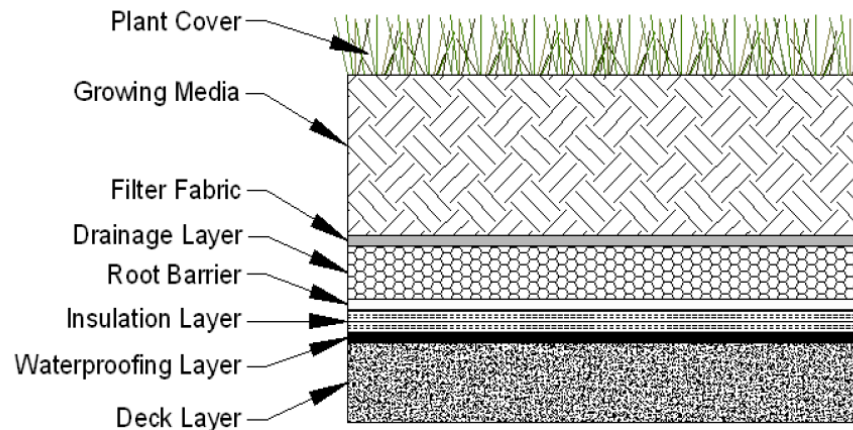


Figure 3.1.1. Typical Layers for a Green Roof.

### Equation 3.1.1. Storage Volume for Green Roofs.

$$Sv = SA \times \frac{[(d \times \eta_1) + (DL \times \eta_2)]}{12}$$

Where,

- Sv = storage volume (cu. ft.)
- SA = green roof area (sq. ft.)
- d = media depth (in.) (minimum 3 in.)
- $\eta_1$  = media porosity (typically 0.25 but consult manufacturer's specifications)
- DL = drainage layer depth (in.)
- $\eta_2$  = drainage layer porosity (consult specific product specifications)

## 1. Green Roof (continued)

**Table 3.1.1. Extensive green roof material specifications.**

Material	Specification
Roof	Structural capacity should conform to ASTM E-2397-05, <i>Practice for Determination of Live Loads and Dead Loads Associated with Green (Green) Roof Systems</i> . In addition, use standard test methods ASTM E2398-05 for <i>Water Capture and Media Retention of Geocomposite Drain Layers for Green (Vegetated) Roof Systems</i> , and ASTM E 2399-05 for <i>Maximum Media Density for Dead Load Analysis</i> .
Leak Detection System	Optional system to detect and locate leaks in the waterproof membrane.
Waterproof Membrane	See Chapter 6 of Weiler and Scholz-Barth (2009) for waterproofing options that are designed to convey water horizontally across the roof surface to drains or gutter. This layer may sometimes act as a root barrier.
Root Barrier	Impermeable liner that impedes root penetration of the membrane.
Drainage Layer	Depth of the drainage layer is generally 0.25 to 1.5 inches thick for extensive designs. The drainage layer should consist of synthetic or inorganic materials (e.g., gravel, recycled polyethylene, etc.) that are capable of retaining water and providing efficient drainage. Designers should consult the material specifications as outlined in ASTM E2396 and E2398. Roof drains and emergency overflow should be designed in accordance with District Construction Code (DCMR, Title 12).
Filter Fabric	Needled, non-woven, polypropylene geotextile. Density (ASTM D3776) > 16 oz. per sq. yd. or approved equivalent. Puncture resistance (ASTM D4833) > 220 lbs. or approved equivalent.
Growth Media	80% lightweight inorganic materials and 20% organic matter (e.g. well-aged compost). Media should have a maximum water retention capacity of around 30%. Media should provide sufficient nutrients and water holding capacity to support the proposed plant materials. Determine acceptable saturated water permeability using ASTM E2396-05. Proprietary systems may vary from these specifications.
Plant Materials	Sedum, herbaceous plants, and perennial grasses that are shallow-rooted, self-sustaining, and tolerant of direct sunlight, drought, wind, and frost. See ASTM E2400-06, <i>Guide for Selection, Installation and Maintenance of Plants for Green (Vegetated) Roof Systems</i> .